Firmware Swapping on Zune 30 (Keel) Models

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Introduction and Purpose

This document is intended to outline how the Zune 30 searches for and installs firmware from the attached storage. By no means is this an extensive explanation, simply a write-up of how I understand it to work and what I believe it is doing. In the process, this document will also explain how to replace your Zune 30's firmware with any other **officially** released firmware for the Zune 30, simply by connecting the Zune's hard disk directly to the PC. This includes firmwares that have never been released alongside desktop software bundles with .cab installers. *You cannot install unofficial firmware using this guide.*

Hypothetically, I think that this same process would work on other hard drive based models, such as the Zune 80 and 120. The Zune 80 is codenamed Draco, and thus uses the DracoBaseline.cab file. I believe the Zune 120 also uses Draco-based firmware. However, I do not have an 80 or 120 handy for testing. Further testing (perhaps by you, you intrepid little go-getter) will reveal whether or not these steps will work for Draco-based devices.

This process will not work whatsoever for flash-based Zune models as there is no practical way to access the NAND flash memory. Additionally, I have reason to believe that the flash-based Zune models store things entirely different from their hard disk-based siblings. As far as I know, no one has ever dumped the entire contents of a flash-based Zune; this would be an interesting exercise and one that might produce a similar process down the road, but ultimately nothing has come of that yet. In the meantime, flash-based Zune models can only be flashed with a different official firmware using a self-hosted method and .cab files, or through zuneupdate.com.

Why Bother?

Right out of the gate, I will admit that this method does not hold much intrinsic value, outside of being a neat trick. If you are simply looking to upgrade a Zune to the latest official firmware (3.3, for the Zune 30) then simply use a self-hosted method or zuneupdate.com—the method described here is a very impractical way of doing things if that's all you want to do. The method described is simply for archival purposes—if you want to see what things were like on Zune back in the olden days!

Certain firmwares for the Zune were only released through online updating methods. They were never released bundled with the ZuneSetupPkg (the desktop software installer) that you could download through Microsoft's website. While Microsoft would send out a .cab installer for these firmwares, it only existed in AppData and as such it is highly unlikely that those specific .cab files exist anymore, on anyone's hard drive. These firmwares now exist only on a shrinking number of original Zunes, and may end up being lost to time if they are not archived properly. This method takes the three firmware files from the cab—**nk.bin, recovery.bin, and eboot.bin**, and installs them directly to the Zune from the hard disk itself as opposed to using a cab installer.

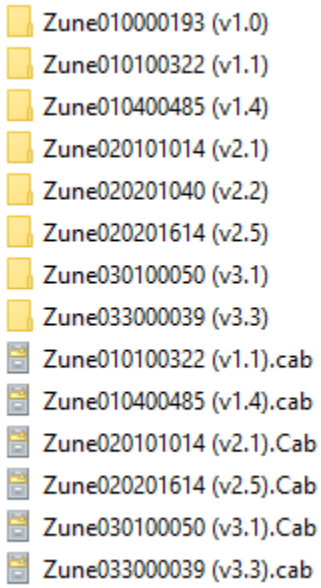
Talking Firmware

So what firmwares are out there, available for flashing? Let's break it down. A peek at zuneprod.xml (used for self-hosted updates, typically) shows us all the officially released firmwares for the Zune 30:

```
<SupportedUpgradeBaseVersions>
  <UpgradeFrom Version="00.00.00000.00-00.00" />
  <UpgradeFrom Version="00.00.00000.00-00000" />
  <UpgradeFrom Version="01.00.00193.00-02.04" />
  <UpgradeFrom Version="01.01.00322.00-00309" />
  <UpgradeFrom Version="01.02.00434.00-00425" />
  <UpgradeFrom Version="01.03.00482.00-00425" />
  <UpgradeFrom Version="01.04.00485.00-00425" />
  <UpgradeFrom Version="02.01.01014.00-00425" />
  <UpgradeFrom Version="02.02.01040.00-00425" />
  <UpgradeFrom Version="02.03.01145.00-00435" />
  <UpgradeFrom Version="02.05.01614.00-00435" />
  <UpgradeFrom Version="03.00.00225.00-00435" />
  <UpgradeFrom Version="03.01.00050.00-00435" />
  <UpgradeFrom Version="03.20.00034.00-00435" />
  <UpgradeFrom Version="03.20.00035.00-00435" />
</SupportedUpgradeBaseVersions>
```

3.3 is not included in this list, as it is the latest available firmware. In addition, I believe "0.0" refers to the Zune's "recovery mode". I have no idea why there are two versions of 0.0.

What firmwares have been preserved? Here's what I have gathered together, so far (in both raw files and .cab format).



As you can see, several firmwares are missing from this list. 1.2, 1.3, 2.3, 3.0, and 3.2 have not been found yet. 3.0 may exist in an original download of the ZuneSetupPkg for desktop 3.0. The other firmwares are probably only extant on Zunes running those versions. If you have a Zune 30 running one of these five missing firmwares, or you have the 3.0 ZuneSetupPkg, PLEASE PLEASE PLEASE reach out to my handle on Discord so that we can dump and preserve that firmware. You may be one of the very few people left with a copy of it!

Talking Firmware, Part 2

Let's say you're turning on your Zune for the first time in a while. It will boot, show you the progress bar, and then enter the main shell, from where you can select what media you want to play. While the boot process normally takes less than ten seconds, and doesn't appear to be doing much anything important, there's actually a lot going on under the hood in those ten seconds. The primary thing we'll focus on is the Zune's update check.

Two partitions exist on the Zune's hard disk, both named TFAT (Transaction Safe File System). The first partition on the drive is 150MB, and contains the Zune's system files. That's the partition we'll be focusing on here. The second partition takes up all remaining disk space (anywhere from 27.2GB to 118.06GB, depending on what size drive you have installed on your Zune). The second partition only includes your media and isn't of much interest. Whenever a blank hard disk is inserted into the Zune, these partitions are created according to the limitations of the drive.

Let's talk the 150MB TFAT partition. When you connect the hard disk to a PC using a ZIF to USB adapter, these are the contents of the partition. This is pulled from a Zune 30 running 3.3.

This PC › TFAT (E:) Search TFAT (E:)

Name	Date modified	Type	Size
System Volume Information	4/9/2021 5:06 PM	File folder	
EBOOT.bin	10/11/2007 10:53 AM	Snes9x ROM	257 KB
FWUpdate_LastError.dat	1/1/2003 11:00 AM	DAT File	1 KB
nk.bin	10/26/2007 5:58 PM	Snes9x ROM	10,457 KB
pmcstore.edb	1/1/2003 11:00 AM	EDB File	56 KB
pmcver.dat	1/1/2003 11:00 AM	DAT File	1 KB
RECOVERY.bin	10/26/2007 5:58 PM	Snes9x ROM	1,114 KB
zconfig.dat	1/1/2003 11:00 AM	DAT File	64 KB
Recycle Bin	4/9/2021 5:08 PM	File folder	

Remember, **nk.bin, recovery.bin, and eboot.bin** are the main system files. This is typical for Windows CE installations. FWUpdate_LastError is not clear to me on what it does; I think it's just a dump file for a tech in case firmware doesn't flash properly. pmcstore.edb contains several data points that the Zune syncs with your PC every time it connects, including play counts, etc. It also contains the name of your Zune device. I do not know what pmcver.dat does, either, nor do I zconfig.dat. zconfig.dat also appears to only exist in later versions of the firmware, as I do not see it on drives installed with 1.x versions.

When the Zune boots, one of the first things it does immediately is check for these files. If any of them are not present on boot, or have been modified, the Zune will fail to boot and demand you connect it to a computer (so that it can reinstall these files and boot properly again). The Zune also checks for the *integrity* of the files. If it detects that they have been modified improperly (aka you're trying to run unofficial code), it will not boot and will demand a PC connection.

Talking Firmware, Part 3

My original thought process as I was tinkering with the Zune firmware was that the firmware .bins existed on the hard drive and were executed directly off of the drive itself. This was a bit of naïve thinking on my part though. My current understanding is that during the initial installation of the firmware, when the Zune is connected to a PC and is updating through the desktop software, the cab files are unpacked and copied to the 150MB TFAT partition on the Zune's drive. These files are then further processed by the Zune itself. Once the files have been copied to the Zune's hard disk, the Zune then flashes eboot.bin and recovery.bin to the onboard Intel 28F160C3. At runtime, nk.bin is unpacked into RAM, from where the Zune's onboard OS runs.

What makes the method I am about to describe work is the fact that, once the files have been copied over to the Zune, it does not need the PC anymore. In fact, it only needed the PC in the first place for one specific step: copying the files. When you copy the firmware files directly to the hard drive, it entirely bypasses the Zune desktop software and thus skips that step. Otherwise, the Zune does all the rest of the hard work. Technically this means we can up- or downgrade to any official firmware release we'd like to simply by copying the requisite nk.bin, eboot.bin, and recovery.bin!

Getting To It: Directly Installing Firmware

From this point forward, I am not responsible for any damage you may end up doing to your device. Something can always go wrong and you assume any risk of bricking or outright breaking your Zune. Please do not attempt any of this if you are not sure what you are doing. This will most likely erase any content already on your Zune. Backup everything just in case.

Now for the juicy part: how do we do it? Here's a list of the things you'll need:

1. Zune 30.
2. A ZIF HDD or SSD to copy files to.
3. A USB to ZIF adapter. Some work, some don't.
4. Firmware files for the Zune 30. You cannot use files meant for another model Zune, such as Scorpius, Draco, Pavo, etc.
5. Any desktop computer.

The first thing you'll want to do is to boot the Zune with the HDD/SSD you intend to use with the Zune and the "new" firmware. If your Zune has already been in use for a while, then you don't need to worry about this. But if you've just bought a new KingSpec SSD, for example, then you need to insert it into the Zune at least once and boot the Zune before doing anything else—that way the Zune automatically formats your drive properly.

You'll need to remove the hard drive from the Zune entirely. This is a fairly simple process and as such I won't cover it here—many excellent YouTube videos and iFixIt guides out there. Once the hard drive is removed, connect it to your ZIF adapter and hook it up to your PC. Give it just a moment, and it should automatically be detected by Windows. (If it isn't, or it keeps disconnecting and reconnecting over and over again, your drive is dying and you need to replace it soon.) You will see the aforementioned two partitions show up in File Explorer. Open up the 150MB partition.

TFAT (E:) | Search TFAT (E:)

Name	Date modified	Type	Size
Recycle Bin	4/9/2021 5:08 PM	File folder	
System Volume Information	4/9/2021 5:06 PM	File folder	
EBOOT.bin	10/11/2007 10:53 AM	Snes9x ROM	257 KB
FWUpdate_LastError.dat	1/1/2003 11:00 AM	DAT File	1 KB
nk.bin	10/26/2007 5:58 PM	Snes9x ROM	10,457 KB
pmcstore.edb	1/1/2003 11:00 AM	EDB File	56 KB
pmcver.dat	1/1/2003 11:00 AM	DAT File	1 KB
RECOVERY.bin	10/26/2007 5:58 PM	Snes9x ROM	1,114 KB
zconfig.dat	1/1/2003 11:00 AM	DAT File	64 KB

If your Zune has already been running and you've synced content to it previously, the above is what your 150MB partition will look like. Make sure you're in the 150MB partition, and not your content partition! (If you've just booted once on a new drive, none of these files will be here.) Select the files above and delete them. If you don't care about preserving your Zune's device name, delete pmcstore and pmcver as well. Don't bother doing anything about the System Volume Information folder.

Next, navigate to the firmware files you want to flash onto the device. In this example, we'll be flashing v1.0—the original firmware most Zune 30s ran out of the box, but got overwritten by v1.1 by the CD in the box. How strange. v1.0 only exists as raw files—there is no cab installer so this is the only way to flash it. The same process applies for any Zune 30-based firmware you want to flash. Select these three files and copy them to the root of the 150MB TFAT partition.

Zune SD › Zune01000000 (v1.0) | Search Zune01000000 (v1.0)

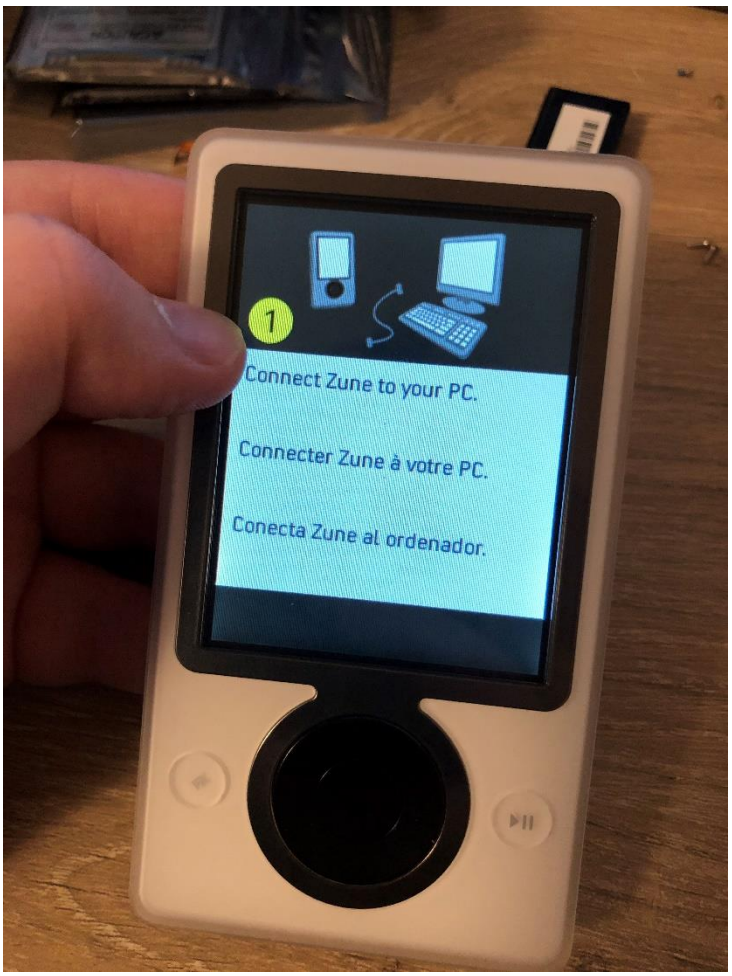
Name	Date modified	Type	Size
EBOOT.bin	9/19/2006 12:54 PM	Snes9x ROM	257 KB
nk.bin	9/19/2006 12:54 PM	Snes9x ROM	10,437 KB
RECOVERY.bin	9/19/2006 12:54 PM	Snes9x ROM	1,277 KB

AT (E:) Search TFAT (E:)

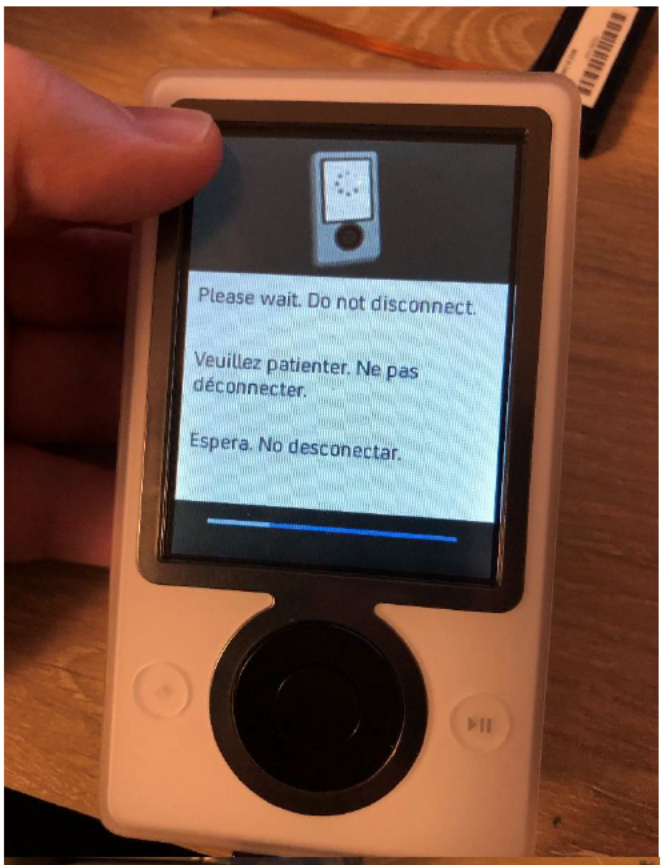
Name	Date modified	Type	Size
Recycle Bin	4/9/2021 5:08 PM	File folder	
System Volume Information	4/9/2021 5:06 PM	File folder	
pmcstore.edb	1/1/2003 11:00 AM	EDB File	56 KB
pmcver.dat	1/1/2003 11:00 AM	DAT File	1 KB
RECOVERY.bin	9/19/2006 12:54 PM	Snes9x ROM	1,277 KB
EBOOT.bin	9/19/2006 12:54 PM	Snes9x ROM	257 KB
nk.bin	9/19/2006 12:54 PM	Snes9x ROM	10,437 KB

Disconnect the ZIF adapter carefully. Remove the cable from the hard drive. Reattach the drive to the Zune. Ensure the Zune is LOCKED (that way it doesn't boot yet). Reattach the battery to the Zune. You can put the frame on if you want, but I prefer to keep the frame off until the whole process is done and I know I don't have to mount the hard disk to my computer again.

Now, making sure to hold the battery and the hard drive in place, unlock the Zune. It will boot and send you to this screen.



I would advise at this point ensuring that the Zune software is closed (yes, closed) on your PC and that you disable autolaunch when a Zune is connected. Connect the sync cable to your desktop, then to your Zune. It will immediately throw you to this next screen. This means the Zune is installing the firmware. It will reboot several times—do not panic. Do not disconnect the sync cable at any point.



After a couple minutes, the Zune will boot into your firmware! It's safe to disconnect the Zune at this point. Congratulations: you've successfully flashed a different firmware. Remember, you can do this with any official Zune 30 firmware that you have the files for, and in any direction—you can upgrade from 1.0 to 3.3, or vice versa. Firmwares can now be a matter of personal preference.

Questions That Will Be Frequently Asked

Can I use this method to flash my own modified firmware, or firmware from another CE-based device?

No. The Zune automatically checks each image for Microsoft's signature. If that signature is not found, the Zune will format the entire 150MB TFAT partition as a security measure. There is no practical way around this.

Can I flash *any* official Zune firmware (such as the firmware for a 80, or a Zune HD) to my 30 using this method?

No. You can only flash Zune 30 firmwares to a Zune 30. Most cab installers will be named "KeelBaseline.cab" (Keel being the internal nickname for the 30). The Zune will similarly reject alternate firmwares just like it does with unofficial images.

Can I run multiple firmwares on the same device using this method?

At the moment, no. However, a solution may exist for this via OpenZDK. In theory, firmware files could be stored on the larger content partition, copied over to the 150MB partition using an OpenZDK application, and then the device could be rebooted to install this new firmware. I do not have the programming ability to put together such an application, but would be interested in partnering with someone if they wanted to take a shot at it. In addition, the issue of preserving the music database between firmwares would need to be resolved as well—something I address in the next question.

Will my music/podcasts/videos survive the firmware replacement process?

Here's the beautiful part: I really don't know. Previously, I said that this procedure would most likely wipe your entire Zune. However, in my testing, about five out of ten times I used this method, the entire content portion of the Zune was preserved completely. Sometimes it wiped, sometimes it didn't. I haven't tested to see exactly what triggers the wipe or not and will be doing more testing later to find out why this happens. If I could crack this, and the theoretical OpenZDK application was designed, then the possibility of a "dual-boot Zune"—however impractical—would open up!

Why the hell did you type an eight-page document to describe replacing just three files?

People know that when I talk, I talk a lot. I wanted to make sure I documented as much of this process as I could and to also take note of all the little auxiliary things I've learned along the way. Plus, I hate coming upon tutorials on the internet that forget to mention a lot of important things and expect you to know everything already. Lots of the stuff described here isn't documented elsewhere. I don't think I've missed any of those things here, and I'm pretty happy about that. Archiving and preservation is important to me, especially with hardware as sentimental as the Zune, and this procedure helps us to relive some of the older days.

Thanks for reading my guide!